IN THE CLAIMS

1. (Currently Amended) A fluid heating system, comprising:

a heat pump;

a tank;

a tank inlet that carries fluid from the heat pump to the tank;

a tank outlet that carries fluid from the tank to the heat pump;

a tank temperature sensor that measures a fluid temperature in the tank; and

a controller that controls the heat pump based on a first threshold, a second threshold higher than the first threshold, and at least an output from the tank temperature sensor, wherein the controller energizes the heat pump when the tank temperature sensor output falls below the first threshold, said controller causing the heat pump to de-energize when a temperature within the fluid heating system reaches the second threshold.

2. (Original) The fluid heating system of claim 1, wherein the controller causes the heat pump to de-energize when the tank temperature sensor reaches the second threshold.

3. (Original) The fluid heating system of claim 1, further comprising a tank inlet temperature sensor, wherein the controller de-energizes the heat pump when a value based on an output from the tank inlet temperature sensor reaches the second threshold.

4. (Original) The fluid heating system of claim 3, wherein the value is an estimated tank outlet temperature calculated from the output from the tank inlet temperature, a system capacity and a flow rate, and wherein the controller causes the heat pump to de-energize if the estimated tank outlet temperature reaches the second threshold.

5. (Original) The fluid heating system of claim 1, further comprising a tank outlet temperature sensor, wherein the controller de-energizes the heat pump when an output from the tank outlet temperature sensor reaches the second threshold.

6. (Original) The fluid heating system of claim 1, wherein the heat pump employs a transcritical vapor compression cycle.

7. (Original) The fluid heating system of claim 1, wherein the heat pump uses carbon dioxide as a refrigerant to obtain the transcritical vapor compression cycle.

8. (Original) The fluid heating system of claim 1, wherein the tank temperature sensor is disposed generally at a midpoint portion of the tank.

9. (Currently Amended) A fluid heating method, comprising, comprising:

measuring a tank temperature; and

controlling a heat pump based on a first threshold, a second threshold higher than the first threshold, and at least the tank temperature, wherein the heat pump is energized when the tank temperature falls below the first threshold, causing the heat pump to de-energize when a temperature within the fluid heating system reaches the second threshold.

10. (Original) The fluid heating method of claim 9, wherein the controlling step comprises de-energizing the heat pump when the tank temperature reaches the second threshold.

11. (Original) The fluid heating method of claim 9, further comprising measuring a tank inlet temperature, wherein the controlling step comprises de-energizing the heat pump when a value based on the tank inlet temperature reaches the second threshold.

12. (Original) The fluid heating method of claim 11, wherein the value is an estimated tank outlet temperature calculated from the tank inlet temperature, a system capacity and a flow rate, and wherein the heat pump is de-energized if the estimated tank outlet temperature reaches the second threshold.

13. (Original) The fluid heating method of claim 9, further comprising measuring a tank outlet temperature, wherein the controlling step comprises de-energizing the heat pump when the tank outlet temperature reaches the second threshold.

14. (Currently Amended) A fluid temperature control for a fluid heating system, comprising:

a heat pump;

a tank temperature sensor that measures a fluid temperature in a tank; and

a controller that controls the heat pump based on a first threshold, a second threshold higher than the first threshold, and at least an output from the tank temperature sensor, wherein the controller energizes the heat pump when the tank temperature sensor output falls below the first threshold, said controller causing the heat pump to de-energize when a temperature within the fluid heating system reaches the second threshold.

15. (Original) The fluid temperature control of claim 14, wherein the controller causes the heat pump to de-energize when the tank temperature sensor reaches the second threshold.

16. (Original) The fluid temperature control of claim 14, further comprising a tank inlet temperature sensor, wherein the controller de-energizes the heat pump when a value based on an output from the tank inlet temperature sensor reaches the second threshold.

17. (Original) The fluid temperature control of claim 16, wherein the value is an estimated tank outlet temperature calculated from the output from the tank inlet temperature, a system capacity and a flow rate, and wherein the controller causes the heat pump to de-energize if the estimated tank outlet temperature reaches the second threshold.

18. (Original) The fluid temperature control of claim 14, further comprising a tank outlet temperature sensor, wherein the controller de-energizes the heat pump when an output from the tank outlet temperature sensor reaches the second threshold.

19. (Original) The fluid temperature control of claim 14, wherein the heat pump employs a transcritical vapor compression cycle.

20. (Original) The fluid temperature control of claim 19, wherein the heat pump uses carbon dioxide as a refrigerant to obtain the transcritical vapor compression cycle.